Chlorinated Hydrocarbons and Heavy Metals in River Otter (*Lutra canadensis*) and Mink (*Mustela vison*) Samples from the Coast of British Columbia

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Abstract
Carcasses of trapper-caught mink and river otter and feces of otters from latrine sites were collected at sites around the Strait of Georgia and from reference sites. All samples were analyzed for PCBs and organochlorine pesticides, and selected samples were also analyzed for polychlorinated dioxins (PCDDs) and furans (PCDFs), mercury and cadmium. Results are reported on a lipid weight basis for OCs and dry weight for metals. In scats, mean mercury concentrations varied among sites, ranging from 0.083 mg/kg around Powell River to 0.55 mg/kg in Clayoquot Sound. OC pesticide concentrations in scats were low, with only DDE detected in all samples and at concentrations ranging from 0.01 to 0.15 mg/kg. Concentrations of 2,3,7,8-TCDD ranged from non-detectable (< 1 ng/kg) to 111 ng/kg in a sample from near the pulp mill at Powell River. 2,3,7,8-TCDF ranged from 20 ng/kg at the reference site to 1350 ng/kg in a sample from Esquimalt Harbour. OCDD ranged from 120 ng/kg in Clayoquot Sound to 19100 ng/kg in a pooled sample from the Nanaimo area. PCBs were present in all samples; mean concentration ranged from 0.395 mg/kg near Powell River to 12.3 mg/kg in 4 samples from Victoria Harbour. The geometric mean concentration in scats from Victoria Harbour exceeded the adverse effect level for reproduction of 9 mg/kg lw suggested; scats from one Victoria Hb latrine contained 108 mg/kg total PCBs. Data on contaminant levels in livers and morphometric measurements are being analyzed and will be reported and discussed.

Extended Abstract
The Georgia Basin contains many ports and harbours and receives effluent discharge from multiple industries and municipalities. Aqueous-, sediment- and tissue-concentrations of chlorinated contaminants (PCBs, organochlorine (OC) pesticides, polychlorinated dioxins (PCDDs) and furans (PCDFs), heavy metals) have been assessed in this system. Recently, PCBs have been correlated with biological effects in a number of marine mammal species in the region (Harding et al. 1999; Ross et al. 2000). Studies in the Columbia River watershed found that mink were negatively impacted by chlorinated hydrocarbons, particularly PCBs , and showed endocrine disruption related effects (Henny et al. 1996).

We selected mustelids as our mammalian indicators because individuals do not range great distances, and their habits and prey species are predominantly aquatic (Toweill 1974; Gilbert and Nancekivell 1982; Novak et al. 1987). As carnivores, mink and otter can accumulate relatively high concentrations of persistent contaminants. Published literature has identified these and other mustelids as being sensitive to the toxic effects of some chlorinated hydrocarbons such as PCBs (Tillitt et al. 1996). Studies of declining British otter (*Lutra lutra*) populations have found analysis of feces (scats) to be a useful indication of chlorinated hydrocarbon burdens in otter populations (Mason et al. 1992)

The objectives of our study were to: (1) determine chlorinated hydrocarbon concentrations in otter and mink from urban and industrial areas around the Georgia Basin; (2) relate findings to potential sources of contamination; and (3) compare data to published criteria on critical concentrations in scat and other tissues.

Otter feces were collected during May to August, 1998 at latrine sites around the Strait of Georgia including Victoria Harbour, Esquimalt Harbour, Nanaimo, Powell River, Cowichan Bay and from a reference site (Clayoquot Sound). Scat samples were combined at each latrine site. Skinned mink and otter carcasses were obtained from local trappers from sites suspected or known to have elevated PCBs in the Georgia Basin as well as near a cellulose mill in Prince Rupert, a site of a PCB spill in the 1980s. A total of 119 mink and 27 otter carcasses were obtained during the winters of 1998-2002. All scat samples and liver tissue from a sub-set of carcasses were analyzed for PCBs and OC pesticides; selected samples were also analyzed for PCDDs and PCDFs, mercury and cadmium. Results are reported on a lipid weight basis for OCs and dry weight for metals. All carcasses were examined for abnormalities and parasites; morphology endpoints including age, sex, body condition, sub-cutaneous fat, body and organ weights, baculum weight and length were collected.

Data on contaminant levels in livers are still pending. Therefore results of the carcass portion of the study were not presented at the meeting.

In scats, PCBs were present in all samples; mean concentration of total PCBs ranged from 0.395 mg/kg near Powell River to 12.3 mg/kg in four samples from Victoria Harbour. The geometric mean concentration in scats from Victoria Harbour exceeded the adverse effect level for reproduction of 9 mg/kg lipid wt suggested; scats from one Victoria Harbour latrine contained 108 mg/kg total PCBs. Criteria in scats was determined from back-calculations of the DeVries model in Mason et al (1992) and from Smit et al. (1996) for European populations (assuming coefficients for *lutra* apply to *canadensis*). Mean toxic equivalent (TEQs) values of one sample each from Victoria and Esquimalt Harbours exceeded suggested critical levels of 1500 ng/kg lipid wt; select individuals had contaminants levels exceeding thresholds by over tenfold. Criteria for TEQs in scat was determined as for PCBs. Mean mercury concentrations varied among sites, ranging from 0.083 mg/kg around Powell River to 0.55 mg/kg in Clayoquot Sound. OC pesticide concentrations in scats were low, with only DDE detected in all samples and at concentrations ranging from 0.01 to 0.15 mg/kg. Concentrations of 2,3,7,8-TCDD ranged from non-detectable (< 1 ng/kg) to 111 ng/kg in a sample from near the pulp mill at Powell River. 2,3,7,8-TCDF ranged from 20 ng/kg at the reference site to 1350 ng/kg in a sample from Esquimalt Harbour. OCDD ranged from 120 ng/kg in Clayoquot Sound to 19100 ng/kg in a pooled sample from the Nanaimo area.

Scat appears to be a useful tool to assess chlorinated hydrocarbon contamination in otter. PCB concentrations in scat samples from Victoria Harbour and TEQ concentrations in scat samples from Victoria and Esquimalt Harbours exceeded criteria for reproductive effects in otter. Further work will be needed to determine if exposure to these endocrine-disrupting substances is impacting reproductive success of otter populations in the Georgia Basin.

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